

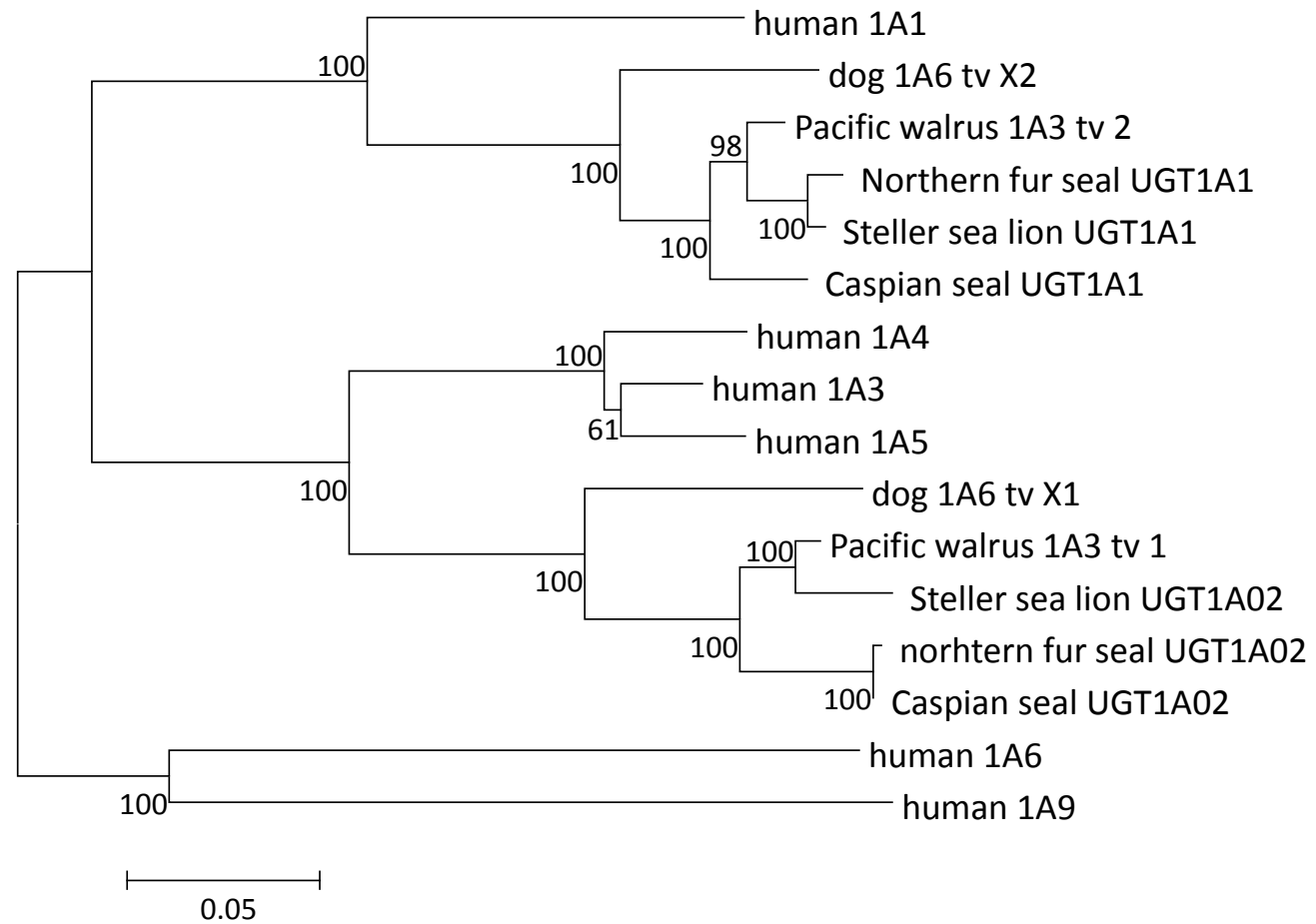


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		10	20	30	40	50	60	70	80	90	100	110	120
dog UGT1A6		CTCAGGACGG	AAGCCACTGG	CTCAGTATGG	AGAACATAGT	TGAGCTCCTC	AGTGAGAAGG	GGCATGACAT	TGTGGTGCTG	GTGCCAGAAG	TCAATT--TG	CTTCTGAAGG	AATCCAAACA
SSL UGT1A6P		CTCAGGTTGG	AAGCCACTGG	CTCAGTATGA	AGGACATAGT	TGAGCTCCTC	AGTGAAAAGG	GGCATGACAT	TGTGGTGCTG	GTACCAGAAG	TCAATTATG	CTTCTGAAGG	AATCCAAGCA
NFS UGT1A6P		CTCAGGTTGG	AAGCCACTGG	CTCAGTATGA	AGAACATAGT	TGGGCTCCTC	AGTGAAAAGG	GGCATGACAT	TGTGGTGCTG	GTACCAGAAG	TCAATTATG	CTTCTGAAGG	AATCCAAGCA
CS UGT1A6		CTCAGGATGG	AAGCCACTGG	CTCAGTATGA	AGGACATAGT	TGAGCTCCTC	AGTCAGAAGG	GGCACGACAT	TGTGGTGCTG	GTACCAGAAG	TCAATT--TG	CTGCTGAAGG	AATCCAAGCA
		130	140	150	160	170	180	190	200	210	220	230	240
dog UGT1A6		CTACACGAGA	CAAATCTACT	CAGTGCCATT	TGGCCAGGAA	GGGTTGGAGA	ACCGCTACCG	CTCTTTTGA	AAGAATCACT	TTGCTGAGAG	ATGGCTCCTG	AACGCTGCTC	AGATGGAGTA
SSL UGT1A6P		CCACACAAGA	AAAATCTACC	CAGTGCCATT	CGACCAGAAA	GAGCTGGAGA	ATCGTTACCA	CTCTTTTGA	AACAATCACT	TTGCTGAGAG	ATGGCTCCTG	AACGCTGCTC	AGATGGAGCA
NFS UGT1A6P		CTACACAAGA	AAAATCTACC	CAGTGCCATT	CGACCAGAAA	GAGCTGGGGA	ATCGTTACCA	CTCTTTTGA	AACAATCACT	TTGCTGAGAG	ATGGCTCCTG	AACGCTGCTC	AGATGGAGTA
CS UGT1A6		CTACACAAGA	AAAACCTACC	CAGTGCCATT	CGATCAGAAA	GAGCTGGAGA	ATCGTTACCA	CTCTTTTGA	AACAATCACT	TTGCTGAGAG	ATGGCTCCTG	AACACTGCTC	AGATGGAGTA
		250	260	270	280	290	300	310	320	330	340	350	360
dog UGT1A6		CAGAAATAGC	ATGATTGTTA	TTGACATGTA	CTTCACCAAC	TGCCAGAGCC	TTCTGGAGGA	CTCGGCCACG	CTCAGTGTCC	TCAGGCAGAG	CAAGTTTCGAT	GCCCTTTTCA	CAGACCCAGC
SSL UGT1A6P		CGGGAATAGC	GTAATCGTTA	TTGACATGTA	CTTCACCAAC	TGCCAGAGCC	TCCTGGAGGA	CTCGGCCACC	CTGAGTGTCC	TCAGGGAGAG	CAAGTTTCGAT	GCCCTTTTACA	CAGACCCAGC
NFS UGT1A6P		CGGGAATAGC	GTAATTGTTA	TTGACATGTA	CTTCACCAAC	TGCCAGAGCC	TCCTGGAGGA	CTCGGCCACC	CTGAGTGTCC	TCAGGGAGAG	CAAGTTTCGAT	GCCCTTTTACA	CAGACCCAGC
CS UGT1A6		CAGGAATAGC	ATGATGGTTA	TTGACATGTA	CTTCACCAAC	TGCCAGAGCC	TGCTGGAGGA	CTCAGCCACC	CTGAGTGTCC	TCAGGGAGAG	CAAGTTTCGAT	GCCCTTTTCA	CAGACCCAGC
		370	380	390	400	410	420	430	440	450	460	470	480
dog UGT1A6		TCTGCCCTGT	GGGGTGATCC	TGGCCGAGTA	CCTGGGCCCTG	CCCTCCGTGT	ACCTCTTCA-	GGGGCTTCCC	ATGCTCCCTG	GAGCATACTA	TCAGCAGGAG	CCCAAACCCT	GTGTCCCTACA
SSL UGT1A6P		CCTATCCTGC	GGGGTCATCC	TGGCCGAGTA	CCTGGGCCCTG	CCCTCTATGT	ACCTCTTCA	GGGGCTTCCC	ATGCTCCCTG	GAGCATAACAG	TGAGCAGGAG	CCCAAACCCT	GTGTCCCACA
NFS UGT1A6P		CCTATCCTGC	GGGGTCATCC	TGGCCGAGTA	CCTGGGCCCTG	CCCTCTATGT	ACCTCTTCA	GGGGCTTCCC	ATGCTCCCTG	GAGCATACAA	TGAGCAGGAG	CCCAAACCCT	GTGTCCCACA
CS UGT1A6		CCTACCCTGC	GGGGTCATCC	TGGCCGAGTA	CCTGGGCCCTG	CCCTCCGTGT	ACCTCTTCA-	GGGGCTTCCC	ATGCTCCCTG	GAGCATATGA	TGAGCAGGAG	CCCAAACCCT	GTGTCCCACA
		490	500	510	520	530	540	550	560	570	580	590	600
dog UGT1A6		TTCCCAAGTG	CTATACTCAG	TTCTCAGACA	AGATGACATT	TCCCCAACGG	GTGGGCAGCT	ACCTCGTTAA	TTACCTGGAG	ACCTACCTGT	TCTACTGTCT	GTATTCAAAG	TACGAAGACC
SSL UGT1A6P		TTCCCAAGATG	CTAACTCAG	TTCTCAGACC	CGATGACGTT	CCCCAACGG	GTGGCCAAC	ACCTCATTA	TTACTTGGAG	ACCTATCTGT	TCTACTGCCT	GATGTCAAAG	TATGAAGACC
NFS UGT1A6P		TTCCCAAGATG	CTAACTCAG	TGCTCAGACC	CGATGACGTT	CCCCAACGG	GTGGCCAAC	ACCTCATTA	TTACTTGGAG	ACCTATCTGT	TCTACTGCCT	GATGTCAAAG	TATGAAGACC
CS UGT1A6		TTCCCAAGCTG	CTAACTCAG	TTCTCAGACC	AGATGACGTT	CCCCAACGG	GTGGCCAAC	ACCTCGTTAA	TTCTTGGAG	ACCTATCTGT	TCTGCTGCCT	GTATTCAAAG	TATGAAGACC
		610	620	630	640	650	660						
dog UGT1A6		TTGCATCCAA	TATCCTCATG	AGAGATGTGC	ACTTACCCAC	CTTGTATCGG	AACGGCTCCA	TT					
SSL UGT1A6P		TCACCTCCAA	TATCCTCAAG	GGAGCTGTGC	ACTTACCCAC	CTTGTATCGG	AGGGGCTCCA	TT					
NFS UGT1A6P		TCACCTCCAA	TATCCTCAAG	AGAGCTGTGC	ACTTACCCAC	CTTGTATCAG	AGGGGCTCCA	TT					
CS UGT1A6		TCACCTCCAA	TATCCTCAAG	AGAGATGTGC	ACTTACCCAC	CTTGTATCGG	AAGGGCTCCA	TT					

Supplementary figure 1. Alignments of UGT1A6 nucleotide sequences.
 SSL: Steller sea lion, NFS: Northern fur seal, CS: Caspian seal



Supplementary figure 2. Phylogenetic tree of UGT1A genes to identify Pinnipedia UGT1A gene sequences

	10	20	30	40	50	60	70	80	90	100	110	120
dog UGT1A1	MAAEAPGPRP	LVLGLLLCAL	SAPVSQGGKL	LLIPVDGSHW	LSMLGVVKQL	HQRGHEVVVI	ASEASVYIKG	AAFYTLKRYP	VPFRREDVEA	TFTSLGRGVF	ENVPLLRVI	KTYKKVKEDS
SSL UGT1A1	--AGSQGPRP	LVLGLLLCAL	SPTVSQGGKL	LLVPVDGSHW	LSMLGIVQQL	HQRGHDIIVL	AHEASVHIKE	GALYTLKRYP	VPFRREDVEA	AFIRLGHGVF	ENESLLQRVV	KMYKKVKEDS
NFS UGT1A1	--AGSQGLRP	LVLGLLLCAL	NPTVSQGGKL	LLVPVDGSHW	LSMLGIVQQL	HQRGHDIIVL	AHEASVHIKE	GALYTLKRYP	VPFRREDVEA	AFIRLGHGVF	ENEPLLQRVV	KMYKKVKEDS
CS UGT1A1	--AGARGPRP	LVLGLLLCAL	NPTVSQGGKL	LLVPVDGSHW	LSMLGVVRQL	HQRGHDIIVL	AHEASVHIKE	GALYTLKRYP	VPFRREDVEA	AFIRLGHGVF	EKEPLLQRVV	KTYKKVKEDS
	130	140	150	160	170	180	190	200	210	220	230	240
dog UGT1A1	ALLLSACSHL	LHNKELMASL	AESSFDAVLT	DPFLPCGPIV	ALYLALPAVF	FLHALPCSLD	FQGTQCPNPP	SYVPRALSLN	SDHMTFLQRV	KNMLIFLSES	FLCNVVYSPY	EPLASEVLQK
SSL UGT1A1	ALLLSACSHL	LHNKELMASL	VESSFDAVLT	DPFLPCGPIV	ALYLGLPAVF	FLNALPCGLD	FQGTLCNPP	SYVPRALSLN	SDHMTFLPRV	KNMLIFLSES	FLCNVFYSPY	GPLASEVLQK
NFS UGT1A1	ALLLSACSHL	LHNKELMASL	VESNFDVLT	DPFLPCGPIV	ALYLGLPAVF	FLNALPCGLD	FQGTLCNPP	SYVPRALSLN	SDHMTFLPRV	KNMLIFLSES	FLCNVVYSPY	GPLASEVLQK
CS UGT1A1	ALLLSACSHL	LHNKELMASL	VESNFDVLT	DPFLPCGPIV	ALYLALPAVF	FLNALPCGLD	FQGTQCPSP	SYVPRALSLN	SDHMTFLPRV	KNMLIFLSES	FLCNVVYSPY	GPLASEVLQK
	250	260	270	280	290	300	310	320	330	340	350	360
dog UGT1A1	DVTVQELMGS	ASIWLLKGDF	VKDYSRPIMP	SMVFVGGINC	ASKNPLSKEF	EAYVNASGEH	GIVVFSLGSM	VSDIPEKKAM	EIADALGKIP	QTVLWRYTGT	PPPNLSKNTI	LVKWLPQNDL
SSL UGT1A1	DMTVQDLMGS	ASLWLLRSDF	VKDYSRPIMP	NMVFVGGINC	ASKSPLSKEF	ETYVNASGEH	GIVVFSLGSM	VSEIPEKKAM	EIADALGKIS	QTVLWRYTGT	PPPNLAKNTI	LVKWLPQNDL
NFS UGT1A1	DMTVQDLMGS	ASLWLLRSDF	VKDYSRPIMP	NMVFVGGINC	ASKSPLSKEF	ETYVNASGEH	GIVVFSLGSM	VSEIPEKKAM	EIADALGKIS	QTVLWRYTGT	PPPNLAKNTI	LVKWLPQNDL
CS UGT1A1	DMTVQDLMGS	ASLWLLRSDF	VKDYSRPIMP	NMVFVGGINC	ASKNPLSKEF	EAYVNASGEH	GIVVFSLGSM	VSEIPEKKAM	EIADALGKIP	QTVLWRYTST	PPPNLAKNTI	LVKWLPQNDL
	370	380	390	400	410	420	430	440	450	460	470	480
dog UGT1A1	LGHPKARAFI	THSGSHGIYE	GICNGVPMVM	LPLFGDQMDN	AKRMETRAGAG	VTLNVLEMTS	ADLANALKAV	INDKSYKENI	MHLSRLHKDR	PIEPLDLAVF	WVEFVMRHKG	APHLRPAAMD
SSL UGT1A1	LGHPKTRAFI	THSGSHGIYE	AICNGVPMVM	LPLFGDQMDN	AKRMETRGTG	VTLNILEMTS	EDLANAIKTV	INDKSYKENI	MHLSGLHKDR	PIEPLDLAVF	WVEFVMRHKG	APHLRAVAHD
NFS UGT1A1	LGHPKTRAFI	THSGSHGIYE	AICNGVPMVM	LPLFGDQMDN	AKRMETRAGAG	VTLNILEMTS	EDLANAIKTV	INDKSYKENI	MHLSGLHKDR	PIEPLDLAVF	WVEFVMRHKG	APHLRAVAHD
CS UGT1A1	LGHPKTRAFI	THSGSHGVYE	GICNGVPMVM	LPLFGDQMDN	AKRMETRAGAG	VTLNVLEMTS	EDLANAIKTV	INDKSYKENI	MHLSRLHKDR	PIEPLDLAVF	WVEFVMRHKG	APHLRSAAMD
	490	500	510	520	530							
dog UGT1A1	LTWYQYHSLD	VIGFLLAVVL	GVPFITYKCC	AFGCRKCFGK	KGRVKKPHKS	KAH*QVGGK						
SSL UGT1A1	LTWYQYHSLD	VIGFLLAIVL	GVPFITYKCC	ALGCRKCFGK	KGRVKKPHKS	KAH*EVGGK						
NFS UGT1A1	LTWYQYHSLD	VIGFLLAIVL	GVPFITYECC	ALGCRKCFGK	KGRVKKSHKS	KAH*EVGGK						
CS UGT1A1	LTWYQYHSLD	VIGFLLAIVL	GVPFITYKCG	TLAYRRCFGK	KGRV-----	-----						

Supplementary figure 3. Alignments of UGT1A1 protein sequences.
SSL: Steller sea lion, NFS: Northern fur seal, CS: Caspian seal

	10	20	30	40	50	60	70	80	90	100	110	120
dog UGT XM	MAAGFLAPLP	VL TGLLLILC	DGRWVEGGRV	LVVPMDGSHW	LSMKKAVQKL	HARGHQMVVV	SPESNMHIKE	EDFFTLTTYA	TPYTQEEFDN	FMLGQSYLVF	QRMSFLKTFE	KTMEGLKTAT
SSL UGT1A02	MAARFLVPLP	TLMGLLIFLC	VGPGAEGGKV	LVVPMDGSHW	LSMKEAVQEL	HARGHQMVVV	SPELNMHIKE	EDFFTLTTYA	SPYTQDEFNH	LLLGQTYLIF	ERMHFLKMFL	KSMESLKSAA
NFS UGT1A02	MAARFLVPLP	ALVGLLLFLC	VGPGAEGGKV	LVVPMDGSHW	LSMKEAMQEL	HARGHQMVVV	SPELNMHIKE	EDFFTLTTYA	IPYTQDEFNH	LLLGQTYLVF	ERMHFLKMFL	KSMESLKSVA
CS UGT1A02	MAARFLVPLP	ALVGLLLFLC	VGPGAEGGKV	LVVPMDGSHW	LSMKEAMQEL	HARGHQMVVV	SPELNMHIKE	EDFFTLTTYA	IPYTQDEFNH	LLLGQTYLVF	ERMHFLKMFL	KSMESLKSVA
	130	140	150	160	170	180	190	200	210	220	230	240
dog UGT XM	LIFQRSCEES	MHNKNLIRHL	NASSFDVLLT	DPVYPCGAVL	ARYLSLPSVF	FLRNIPCDLE	SESTQCPNPS	SYIPRLLTRN	SDHMTFLQRV	KNMLYPLALK	YFCHFSFTPY	ASLASELLQR
SSL UGT1A02	LVFQRSCEEL	LHNKELIRHL	NASSFEVVL	DPVYPCGAVL	AKYLSLPAVF	FLRSIPCDLD	VQGTQCPNPS	SYIPRLFTMN	SDHMTFLQRV	KNMLYPLALK	YICHISFTPY	ASLASELLQR
NFS UGT1A02	LVFQRSCEEL	LRNKELVRDL	NASSFDVLLT	DPVYPCGAVL	AKYLSLPAVF	FLRSIPCDLD	FQGTQCPNPP	SYIPRLTMTN	SDHMTFLQRV	KNMLYPLALK	YICHISFTPY	ASLASELLQR
CS UGT1A02	LVFQRSCEEL	LRNKELVRDL	NASSFDVLLT	DPVYPCGAVL	AKYLSLPAVF	FLRSIPCDLD	FQGTQCPNPP	SYIPRLTMTN	SDHMTFLQRV	KNMLYPLALK	YICHISFTPY	ASLASELLQR
	250	260	270	280	290	300	310	320	330	340	350	360
dog UGT XM	EVSLEDILSS	GSVWLFGRGF	VLDYPRPIMP	NMFFIGGINC	ANRKPLSQEF	EAYVNASGEH	GIVVFSLGSM	VSDIPEKKAM	EIADALGKIP	QTVLWRYTGT	PPPNLSKNTI	LVKWLPQNDL
SSL UGT1A02	EVSMVDVFSF	ASVWLFGRGF	VLDYPRPIMP	NMVFSGGRNC	GQRKPLSQEF	ETYVNASGEH	GIVVFSLGSM	VSEIPEKKAM	EIADALGKIS	QTVLWRYTGT	PPPNLAKNTI	LVKWLPQNDL
NFS UGT1A02	EVSVDVFSF	ASVWLFGRGF	VLDYPRPIMP	NMVFIGGINC	GHRKPLSQEF	EAYVNASGEH	GIVVFSLGSM	VSEIPEKKAM	EIADALGKIP	QTVLWRYTST	PPPNLAKNTI	LVKWLPQNDL
CS UGT1A02	EVSVDVFSF	ASVWLFGRGF	VLDYPRPIMP	NMVFIGGINC	GHRKPLSQEF	EAYVNASGEH	GIVVFSLGSM	VSEIPEKKAM	EIADALGKIP	QTVLWRYTST	PPPNLAKNTI	LVKWLPQNDL
	370	380	390	400	410	420	430	440	450	460	470	480
dog UGT XM	LGHPKARAFI	THSGSHGIYE	GICNGVPMVM	LPLFGDQMDN	AKRMETRGAG	VTLNVLEMTS	ADLANALKAV	INDKSYKENI	MHLSRLHKDR	PIEPLDLAVF	WVEFVMRHKG	APHLRPAABD
SSL UGT1A02	LGHPKTRAFI	THSGSHGIYE	AICNGVPMVM	LPLFGDQMDN	AKRMETRGAG	VTLNILEMTS	EDLANAIKTV	INDKSYKENI	MHLSGLHKDR	PIEPLDLAVF	WVEFVMRHKG	APHLRAVABD
NFS UGT1A02	LGHPKTRAFI	THSGSHGVYE	GICNGVPMVM	LPLFGDQMDN	AKRMETRGAG	VTLNVLEMTS	EDLANAIKTI	INDKSYKENI	MHLSRLHKDR	PIEPLDLAVF	WVEFVMRHKG	APHLRSAABD
CS UGT1A02	LGHPKTRAFI	THSGSHGVYE	GICNGVPMVM	LPLFGDQMDN	AKRMETRGAG	VTLNVLEMTS	EDLANAIKTV	INDKSYKENI	MHLSRLHKDR	PIEPLDLAVF	WVEFVMRHKG	APHLRSAABD
	490	500	510	520	530							
dog UGT XM	LTWYQYHSLD	VIGFLLAVVL	GVPFITYKCC	AFGCRKCFGK	KGRVKKPHKS	KAH*QVGGK						
SSL UGT1A02	LTWYQYHSLD	VIGFLLAIVL	GVPFITYKCC	ALGCRKCFGK	KGRV-----	-----						
NFS UGT1A02	LTWYQYHSLD	VIGFLLAIVL	GVPFITYKCG	TLAYRRCFGK	KGRV-----	-----						
CS UGT1A02	LTWYQYHSLD	VIGFLLAIVL	GVPFITYKCG	TLAYRRCFGK	KGRVKKSHKS	KAH*EVGGK						

Supplementary figure 4. Alignments of UGT1A02 protein sequences.

dog UGT XM: dog XM_005635599.1 SSL: Steller sea lion, NFS: Northern fur seal, CS: Caspian seal